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## IMPACT OF IMPROVISED ORGANIC REAGENTS ON SENIOR SECONDARY SCHOOL STUDENTS' LEVEL OF MOTIVATION IN CHEMISTRY

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### Abstract

This study investigated the impact of improvised organic reagents on senior secondary school students' level of motivation in chemistry. Two research questions guided the study and three hypotheses were formulated and tested at 0.05 level of significance. The research design was a quasi-experimental pretest-posttest non-randomized control group. The sample included 120 Senior Secondary School Three (SS3) chemistry students randomly drawn from four co-educational schools in the Onitsha Education Zone of Anambra State, Nigeria. The instrument used was Students' Motivational Level in Chemistry Questionnaire (SMLCQ) which was developed and validated for data collection. An internal consistency estimate of 0.82 was obtained using Cronbach's alpha procedure. The data generated from the study were analyzed using mean and standard deviation to answer the research questions; two-way analysis of variance and two-way analysis of covariance was used to test the null hypotheses. Results of the findings indicated that improvised organic reagents promote the motivational level of chemistry students. It is recommended that teachers of chemistry should use improvised organic reagents in the teaching of chemistry to increase students' enthusiasm in learning chemistry.

**Keywords:** Impact, Organic reagent, Improvisation, Chemistry, Motivation, Secondary School, Students.

## Introduction

Education in its widest sense is a systematic influence of people's knowledge, skills and attitudes. Such education not only serves obvious utilitarian purposes, but it also cultivates and strengthens the will and the capacity of all people to accept worldwide responsibilities (Okeke, 2010). Fundamentally, he added that the objective of education should be to enable people to initiate, understand and even anticipate changes in their environment and adjust accordingly. This is why Osisioma (2011) pointed out that in the competitive global economy, no nation can survive without developing the skills of its workforce. She maintained that Nigeria is challenged to reposition herself in this new wave of globalization by re-evaluating its education policy to include among others, a well-structured science and technology education that emphasizes knowledge creation and transfer, critical thinking, problem-solving skills, creativity and innovation.

Chemistry is one of the most important branches of science which enables learners to understand what happens around them. It helps them to solve simple problems they encounter daily. Hence, Nnoli (2016) stated that the most interesting aspect of chemistry is that it applies to our daily lives. No wonder the popular slogans: Chemistry is life, what on earth is not chemistry, chemistry rules the world. Chemistry is an experimental subject that can only be effectively taught and learnt by exposing the students to experimentation.

According to Balogun (2017), an improvisation is an act of using materials obtainable from the local environment or designed either by the teacher or with the help of local personnel to enhance instruction. It is also the sourcing, selection and deployment of relevant instructional elements for the teaching and learning process. Improvisation in chemistry requires a proper grasp of chemistry knowledge and a good factual knowledge of the laws of nature. In this study, improvisation involves cutting cocoyam corms, soaked for two days and using the solvent as a reagent to produce trioxonitrate v acid (Udeme-Obong 2004).

Organic, according to Ralph (2005) is something produced from living things or produced without using artificial material. A reagent is any substance used in a chemical reaction. It usually implies a chemical that is added to bring about a chemical change. Therefore, organic reagents are improvised or standard chemical reagents used in the chemistry laboratory to bring about a chemical change when added to a system or added to see if a reaction will occur (Akpuaka, 2009). For example, when the grape is crushed and allowed to ferment for two days, it

can serve as an organic reagent for the production of ethanol. Organic reagents play an important role in modern methods of analysis. Organic reagents are from local plants and animals. Examples include palm oil, oleic oil, olive oil, dyes or Azo-compounds, flowers, fruits, palm wine, animal fats and skins.

Motivation is a psychological feature that arouses an organism to act towards a desired goal (Sass 2000). Motivation elicits, controls, and sustains certain goal-directed behaviours. It can be considered a driving force, a psychological one that compels or reinforces an action towards a desired goal. For example, hunger is a motivation that elicits a desire to eat. Motivation, according to Ezeliorah (2009) is a kind of "personal investment" which is reflected in the direction, intensity, persistence and quality of what is done and expressed.. Motivation may vary in both intensities and direction. Intrinsic motivation is when one is willing to do the work required with no incentive other than interest.

Gender according to Ifeakor (2006), is a socially or culturally constructed characteristic and roles which are associated with males and females in society.

### **Statement of the Problem**

Chemistry has solved so many problems by harnessing the potentials of plant extracts for different uses, more especially in locations where they are not obtainable. These extracts, in as much as they have been made available for everybody to use, are not easily affordable in certain areas of the third world countries in Africa. This makes the materials for the teaching of chemistry inadequate and the concepts abstract. The result is poor academic achievement and, subsequently, poor performance in skills and chemistry external examinations. This is responsible for the fact that Nigerian schools produce graduates who are mere novices in their fields because when a concept is abstract, retention is difficult, and motivational level is not promoted.

Hinged on these, the problem addressed by this study is: would the use of improvised organic reagents enhance students' motivational level in the study of chemistry?

### **Purpose of the Study**

This study was designed to investigate:

1. The level to which the use of improvised organic reagents helps to promote students' motivation in chemistry.

2. The influence of gender on the use of improvised organic reagents in students' motivation in chemistry.

### **Research Questions**

1. What is the pretest and post-test motivation mean scores of students taught chemistry using improvised organic reagents and those taught using standard organic reagents?
2. What is the motivation mean scores of male and female students taught chemistry using improvised organic reagents?

### **Hypotheses**

Ho<sub>1</sub>: There is no significant difference between the pretest and post-test motivation mean scores of students taught chemistry using improvised organic reagents and those taught using standard organic reagents.

Ho<sub>2</sub>: There is no significant difference between the motivation mean scores of male and female students and the use of improvised organic reagents on the students' motivational level in chemistry.

Ho<sub>3</sub>: There is no significant interaction effect between the motivation mean scores of male and female students and treatment as measured by the mean scores in the Students' Motivational Level in Chemistry Questionnaire (SMLCQ)

### **Research Design**

The study is a quasi-experimental non-randomized control-group pretest-posttest design.

### **Area of the Study**

The area of this study was Onitsha Education Zone of Anambra state.

### **Population and Sample**

The population of this study comprised the entire Senior Secondary School three (SS3) chemistry students in the thirty-two public secondary schools in Onitsha Education Zone of Anambra State. The sample comprised 120 SS3 chemistry students from four intact classes in four co-educational schools in Onitsha Education Zone. To avoid inter-class discussions, four

schools were selected from three different Local Government Areas using stratified random sampling techniques. Two intact classes were assigned to experimental groups (Improved organic reagents group), another two intact classes were assigned to control groups (standard organic reagents group).

### The instrument for Data Collection

The instrument for data collection was the Students Motivational Levels in Chemistry Questionnaire (SMLCQ). A 25 items questionnaire was developed based on the experiences of experts, including the researcher.

The instrument was validated. The reliability of SMLCQ was 0.82 using Cronbach's Alpha procedure.

### Method of Data Analysis

The researcher used means and standard deviation to provide answers to the research questions and Analysis of covalence (ANCOVA) to test the significance of the differences that may exist at 0.05 level of significance.

## RESULTS

The results of the data analysis were presented in the tables below in line with the research questions and hypotheses.

**Research Question 1:** What are the pretest and post-test motivation mean scores of students taught chemistry using improvised organic reagents and those taught using standard organic reagents?

**Table 1:** Mean and Standard Deviation of Pretest and Posttest Motivation Mean Scores of Students in the Experimental and Control Groups.

Group	N	Pre Motivation Scores X	SD	Post Motivation Scores X SD	Mean Gain Scores
Exp(Improvise d)	60	58.55	11.23	87.78 7.02	29.23
Control (Standard )	60	62.55	12.58	65.52 12.95	2.97.

Table 1 shows that the experimental group had a mean pretest motivation score of 58.55 and a mean post-test motivation mean score of 87.78. This means that the group that was taught using improvised organic reagents was motivated more than the group that was taught using standard organic reagents.

**Research Question 2:** What are the motivation mean scores of male and female students taught chemistry using improvised organic reagents?

**Table 2:** Mean and Standard Deviation of Male and Female Students' Motivation Treatment Scores.

<i>Group</i>	<i>N</i>	<i>Gender</i>	<i>Mean</i>	<i>Standard Deviation</i>
Experimental (Improvised)	30	Male	88.47	6.39
	30	Female	87.10	7.65

Table 2 shows that the motivation mean scores of the male students in the experimental group was 88.47 while their female counterparts had a motivation mean score of 87.10. In the experimental group, the male mean was slightly higher than that of the female, which means that the male students were motivated slightly more than the female students.

$H_{01}$ : There is no significant difference between the pretest and post-test motivation mean scores of students taught chemistry using improvised organic reagents and those taught using standard organic reagents. The above hypothesis was tested at 0.05 alpha level of significance using a two-way Analysis of Covariance (ANCOVA).

**Table 3:** Two-way Analysis of Covariance (ANCOVA) of Students' Motivation Score on Treatment, Gender and Interaction.

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F -Cal.</i>	<i>F-Crit.</i>	<i>Sig</i>	<i>Decision</i>
Corrected model	19414.228 <sup>a</sup>	4	4853.557	67.549	3.50	.001	S
Intercept	8987.032	1	8987.032	125.076		.001	
PREMOTIV(covariate)	4489.262	1	4489.262	62.479		.001	
GROUP	17277.379	1	17277.379	240.455		.001	

GENDER	11.719	1	11.719	.163	3.50	.686	NS
GROUP *GENDER	7.083	1	7.083	.099	3.50	.754	S
Error	8263.072	115	71.853				
Total	732704.000	120					
Corrected Total	27677.300	119					

The ANCOVA of students' overall motivation mean scores presented in Table 3 reveal the effect of improvised organic reagents in chemistry instruction at 0.05 level of significance. The F-calculated was 125.076 against the F-critical value of 3.50 for 1 df for the numerator and 125 df for the denominator at the 0.05 level of significance. Since the calculated F-value 125.076 exceeded the F-critical value 3.50 the null hypothesis of no significant difference was rejected.

Ho<sub>2</sub>: There is no significant difference between the motivation mean scores of male and female students taught chemistry using improvised organic reagents.

In Table 3 the calculated F-value for gender was 0.163, as against the critical value of 3.50 at 1 df for numerator and 125 for denominator at 0.05 level of significance. Since the value for F-cal (0.163) was less than the F-critical (3.50), the null hypothesis was accepted.

Ho<sub>3</sub>: There is no significant interaction effect between gender and treatment as measured by the mean scores of Students Motivational Level in Chemistry Questionnaire (SMLCQ).

From Table 3 the calculated F-value for treatment – gender interaction was 62.479, as against the critical value of 3.50 for df:1,125 at 0.05, p:0.05. Since the value for F-cal 62.479 exceeded the F-critical 3.50, the null hypothesis was rejected (F-cal. at df: 1, 125=62.479, p>0.05). Similarly, the significance value of 0.001 was less than the 0.05 level of significance on which the hypothesis was stated.

### Summary of the Findings

The result from the data analyzed showed that:

1. The treatment effect was a significant factor in students' overall motivation in chemistry instruction. The experimental group were highly motivated more than the control group.
2. Although gender was not a significant factor in the motivation of students taught chemistry using improvised organic reagents. The female students were highly motivated more than their male counterparts.

3. The interaction effect of gender and treatment was a significant factor in students' overall motivation in chemistry. The male and female students who taught chemistry using improvised organic reagents were highly motivated more than the male and female students who taught using a standard organic reagent.

### **Discussion**

The findings of the study showed that students taught using improvised organic reagents have a higher motivational level than those taught using standard organic reagents. The findings provide useful feedback on the efficacy of improvised organic reagents. This implies that the active involvement of the students in the use of improvised organic reagents gave rise to efficient learning and increases enthusiasm.

### **Conclusion**

Evidence from this study shows that using improvised organic reagents has a significant effect on chemistry students' motivation. The interaction effect of gender and treatment on students' motivation was significant. With this approach, the wheels of change in science education have been set in motion as the learner will now understand the relevance of scientific discoveries rather than just concentrate on learning theories, scientific concepts and facts that seem distant from their realities.

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